A hundred-year-old worm?

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ABSTRACT

The Australian earthworm, *Spenceriella macleayi* (Fletcher 1889) (Megascolecidae: Oligochaeta) is redescribed in detail, an illustration is provided and its taxonomy is discussed. Specimens were collected from managed land at Richmond, NSW, a region within its original distribution range. It was in close association with the introduced lumbricid *Aporrectodea trapezoides* (Dugès). This is the first confirmation of *S. macleayi* since its designation over a century ago and demonstrates that this native species has survived the clearing, cultivation and introduction of exotic species that has accompanied European settlement.

INTRODUCTION

Earthworms were collected as part of an agronomic study conducted in 1992/23 into the distribution of soil fauna in pastures near Richmond, which lies 55 km north-west of Sydney and towards the Blue Mountains, NSW. There have been few if any systematic surveys in this region apart from the early reports of Fletcher (1886–90), consequently, no comprehensive guide to earthworms exists. Moreover, earthworm identification usually entails the sometimes laborious task of microscopic dissection before a specimen can be compared with descriptions of species that are known. This paper describes the process of identification of one native species.

METHODS AND CONVENTIONS

Dissections and illustrations were by RJB using a Wild M5 microscope with *camera lucida*. In the figure (Fig. 1), the clitellum is shown shaded. Abbreviations used are: i ii, etc., segments numbered from the peristomium; 1/2 2/3, etc., intersegmental furrows, i.e., between i and ii, etc.; **a, b,** etc., individual setae from the most ventral on each side; ACT, Australian Capital Territory; NSW, New South Wales; Qld, Queensland; sp.p., spermathecal pores.

SPECIES DESCRIPTION

Spenceriella macleayi (Fletcher, 1889). Comb. nov. (Fig. 1)

Perichaeta macleayi Fletcher, **1889:** 1556–558.

Perichaeta macleayi var. c (i)–(iii) (?non *P. macleayi* vars. a and b) Fletcher, **1890:** 1003–007.

Megascolex macleayi; Beddard, **1895:** 376; (?non vars a, b); Michaelsen, **1900:** 223.

Type-locality: Sydney (33°53′S, 151°12′E), "common in the Hon. W. Macleay's garden at Elizabeth Bay" — Fletcher (1889).

Distribution Records: Mount Victoria, Blue Mountains (33°35′S, 150°15′E) — Fletcher (1890, variety c(i)); Raymond Terrace (32°47′S, 151°45′E) and Morpeth (32°44′S, 151°38′E) — Fletcher (1890, variety c(ii)); Coonabarabran (31°16′S, 149°18′E) and Gunnedah (30°59′S, 150°15′E) from the banks of the Namoi — Fletcher (1890, variety c(iii)), all in NSW; ?Deniliquin, NSW (35°33′S,144°58′E) — Barley and Kleinig (1964).

Syntypes: W1344–1345 in the Australian Museum listed by Reynolds and Cooke (1976).

Material examined: Richmond, NSW (33°36′S, 150°44′E) from the Yarrumundi paddock 3 of the University of Western Sydney, Hawkesbury campus. Collected by Karen Elton, January 1993, under grazed two year-old sown grass/medic pasture following oats in a paddock much cultivated previously. Found in association with the lumbricid *Aporrectodea trapezoides.* The site forms part of a Quaternary terrace of the Nepean and Georges Rivers with soil, mapped as Blackendon sand, a slightly acidic, nutrient-poor red podzolic with a well-drained sandy profile to the depth of sampling (0.9 m).

Deposition No.: AM W21710: four mature specimens, two contracted on preservation, two relaxed but macerated (one a posterior amputee). All inspected, one of each dissected and one contracted specimen drawn (Fig. 1).

External features

Length: 40–75 mm. **Width:** mean about 4 mm. **Segments:** 90 for all three complete

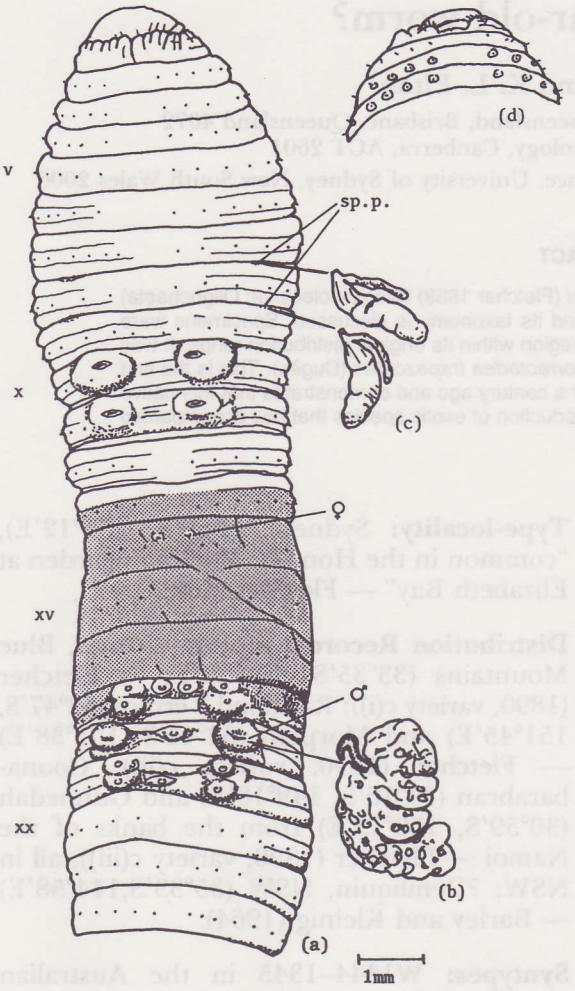

Figure 1. Spenceriella macleayi (a) ventral view with (b) right-hand-side prostate gland and (c) spermathecae shown in relative positons; (d) dorsal view of prostomium.

specimens. Slight secondary annulation from vi. The posterior eight segments dorsally canaliculate in one specimen. **Colour:** dorsum dark-reddish to chocolate brown especially anteriorly, setal auriolae and ventrum pale, clitellum buff. Cuticle not especially iridescent. **Prostomium:** open epilobous or closed by a fine groove parallel and close to inter-segmental furrow 1/2. Peristomium ventrally cleft. **First dorsal pore:** 5/6 (by mucal ejecta), continuous on clitellum. **Setae:** perichaetine (numerous) from ii: 20/vii and >24/xx, with wide mid-ventral and mid-dorsal gaps which preclude setae between the male pores. **Nephropores:** not seen (enteronephric). **Spermathecal pores:** in 7/8 and 8/9, difficult to determine in deep intersegmental furrows approximately as wide apart as male pores (i.e. in line with setae **c** or **d**). **Clitellum:** annular over ½xiii–½xvii, interrupted ventrally in xvii, furrows and setae retained. **Female pores:** paired on xiv, just anterior to setal arc nearly the width of the mid-ventral gap. **Male pores:** largish lateral slits equatorial on xviii on summits of a pair of opposed raised porophores. **Genital Markings:** in x and xi, a pair of raised ventral mounds extending from **a** to **c** setae, each with a translucent, ellipsoid rim to an eye-like pore on the summit. The anterior pair slightly larger. In xvii and xix are paired genital papillae, just ventrad to the line of the male pores, on each side are a presetal and a postsetal pair; in addition there are smaller mid-ventral genital markings, a pair presetally in xvii and a pair (an analogue in one specimen) postsetally in xix. In xviii a single presetal mid-ventral papilla was sometimes present. The anterior annulus of xvii and the posterior annulus of xix are tumid where they accommodate the ventral papillae thus the male field appears as a basin-shaped depression.

Internal anatomy

Septa: 4/5 weak to anterior of gizzard, 5/6 and 6/7 displaced and adpressed by gizzard, thickening to 9/10 or 10/11 thereafter thinning to become membranous after 14/15. **Dorsal blood vessel:** single, continuous onto pharynx. **Hearts:** commissurals vi–ix, hearts x–xii. **Gizzard:** large barrel or cone-shaped in v, has muscular sheen but can be readily deflected. **Calciferous glands:** oesophagus dilated in viii–x and in xiii, but more so in each of xi and xii to form a pair of ventro-laterally sessile calciferous glands that have internal lamellae (i.e., two pairs). Supra-oesophageal vessel not detected. **Intestine origin (caeca, typhlosole):** xv, acaecate, typhlosole not found. **Nephridia:** mero-nephric with pairs of large tufted nephridia ventrally in iv–vi, reducing to parietal forests of micromeronephridia by the clitellar region and thereafter. Pre-septal funnels not seen (possibly numerous per segment?). **Spermathecae:** two pairs in viii and ix with large sub-spherical or elongate ampullae tapering to ducts each bearing near ectal end a shorter, white, digitiform diverticulum. **Ovaries:** in xiii as a large pair of palmate strands of numerous egg strings with paired diaphanous funnels. **Male organs:** holandric, paired sacs in x and xi contain unusually large palmate or "tufted" testes and non-iridescent, nebulous funnels. Paired seminal vesicles are lobulate on posterior septum of ix and racemose on anterior septum of xii. **Prostates:** large, multi-lobed racemose glands extending over 2–4 segments between xvii and xx, with short

muscular ducts once bent. **Gut contents:** when the fine, yellow soil and occasional organic "husks" were flushed away, large quartz crystals (up to 0.5 mm diameter) remained. These were present the length of the gut and may have been selectively ingested to serve as "crop stones" or, alternatively, they may represent involuntary ingestion of a sandy medium. These worms are probably geophagous.

Taxonomic Remarks

This species is clearly assignable to the genus *Spenceriella,* Michaelsen (1907), as it falls within the range of the generic definition as emended by Jamieson (1974) (following the discovery by Jamieson, 1972, that neotypic material of the type-species, *Spenceriella notabilis* (Spencer 1900), had racemose prostates, rather than tubular prostates as originally described by Spencer). The only notable departure from the generic definition is that there are two, rather than three or four, pairs of calciferous glands.

The above description agrees on each point with the original description of external features of *Perichaeta (=Spenceriella) macleayi* (Fletcher **1889:** 1556–558), especially with regard to biometry and the arrangement of genital markings. They also agree in having two pairs of calciferous pouches in xi and xii, which were later described as "so incompletely pinched off as to be little more than dilations" (Fletcher **1890:** 1004). The internal anatomy concurs with Fletcher's (1989) statement that in other respects this species was like *Perichaeta (=Spenceriella) australis* (Fletcher **1886:** 561–65), notwithstanding his mislocating the gizzard in vi rather than v (corrected in Fletcher **1887a:** 399) and his mistaking the seminal vesicles for testes (corrected in Fletcher **1887b:** 602–603). Fletcher (1889) differentiated his dozen specimens of *Spenceriella macleayi* from Sydney from those of *S. australis* from Burrawang, NSW, by their smaller size, the presence of genital markings and possession of only two pairs of calciferous pouches rather than three pairs (in x to xii).

Fletcher (**1890:** 1003–007) went on to describe three "varieties" of *S. macleayi* which he noted separately from each locality. Varieties *a* and *b* (from the Blue Mountains, NSW, and Burrawang, NSW, respectively) differed from the "typical form", not only by having 20–60 more segments, but also in (1) the number and character of the genital markings (2) the position of the first dorsal pore and (3) position of the two pairs of spermathecal pores. Variety *c* from three locations given in the distribution records above), however, were of similar size and consistently had the distinctive papillae in x and xi with "opposite the interval between the first and second setae a pair of fossettes". Consequently, only variety *c* is included here in the synonomy of *S. macleayi* whilst the other varieties are provisionally excluded (cf. Michaelsen 1900).

The arrangement of paired genital markings on x and xi, characteristic of *S. macleayi,* is found also in *S. fecunda* (Fletcher **1887a:** 401–02) from the Blue Mountains, NSW, which nevertheless has four pairs of spermathecae, calciferous pouches in x–xiv and last hearts in xiii. Unravelling the relationship of *S. macleayi* with the *S. fecunda* "variety" from Burrawang, NSW, briefly described by Fletcher (**1890:** 1007–008) as having only two pairs of spermathecae, is not attempted here.

Diagnosis: *Spenceriella macleayi,* as described above, is distinguished from other members of *Spenceriella* by the combined characters of widely paired genital markings, each with a central pore-like depression ventrally in x and xi; paired papillae in xvii and xix; tufted nephridia anteriorly; two pairs of spermathecal pores in 7/8 and 8/9; calciferous pouches in xi and xii and last hearts in xii.

DISCUSSION

J. J. Fletcher was one of the earlier Australian workers who named about 20 native *Perichaeta* species, besides *S. macleayi,* in a series of papers (1886–90). His "varieties" of *S. macleayi* are perhaps part of a species complex, but, as with *S. macleayi* proper, none have subsequently been "re-discovered". A footnote by Barley and Kleinig (1964) makes a passing reference, without further detail, to their having collected *Megascolex macleayi* (Fletcher) along watercourses near Deniliquin, NSW. The above account, then, probably represents the first confirmation of this species since it was designated over 100 years ago.

Spenceriella, of which *S. macleayi* is a representative example, will probably become one of the most numerous native genera by revision of the heterogeneous congeries of *Perichaeta* and *Megascolex* (see Jamieson and Wampler 1979). It is also likely to receive many new species from further collections. Sharing several characteristics with the allied

genus *Gemascolex* Edmonds and Jamieson 1973 (see Jamieson 1974), it is partially differentiated by having segmental rather than intersegmental genital markings (the unpaired female pore and lack of calciferous glands of *Gemascolex* are occasionally met in *Spenceriella*).

The current study demonstrates that *S. macleayi* persists despite cultivation and introduction of exotic species that followed European settlement. It was found in close association with *Aporrectodea trapeziodes* suggesting that this exotic lumbricid is not displacing the native species. Interestingly, this was also the case in Fletcher's original accounts (e.g., 1886, 1887a) where he recorded the presence of both native and exotic groups, with *A. trapezoides* from almost every locality from which he obtained earthworms. Fletcher (1886) noted that the Hon. W. Macleay's garden at Elizabeth Bay, whence he procured *S. macleayi* as well as several exotic species, was then one of the oldest established gardens in Australia to which plants had been brought from many parts of the world.

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